

Measurements of the ppT_x Properties for the Hydrocarbons and Their Mixtures in the Temperature Range to 600 K at Pressures up to 200 MPa

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Recently, the natural working fluids such as CO₂, hydrocarbons, and their mixtures are considered as long-term alternatives for replacing HFCs, and as working fluids for the high energy efficiency heat pump water heater. For further improvements and higher efficiency of several energy conversion systems, more reliable experimental information will be required, especially in the higher temperature and pressure regions for fluids. Taking such background into account, we aimed to propose new and more reliable (p , ρ , T , x) properties for such natural refrigerants in higher temperatures and pressures, those of which will be effective for the development of more reliable thermodynamic equations of state in the near future. During the measurements, we used the metal-bellows variable volumeter for the measurements in higher pressures up to 200 MPa. For the measurements in higher temperature regions, this apparatus has a thermostated air bath, in which the temperatures of the sample vessel can be raised up to 600 K, and can also be controlled to within ± 3 mK. The goals of the present study are to elucidate the binary and/or ternary interactions of such natural working fluids with quantitative accuracy for further improvement of the available equations of state. In this presentation, we will report new measurements in higher ranges of temperatures and pressures, and will also report the systematic comparisons with the available thermodynamic property model to confirm reproducibility over the range of validity of the models.